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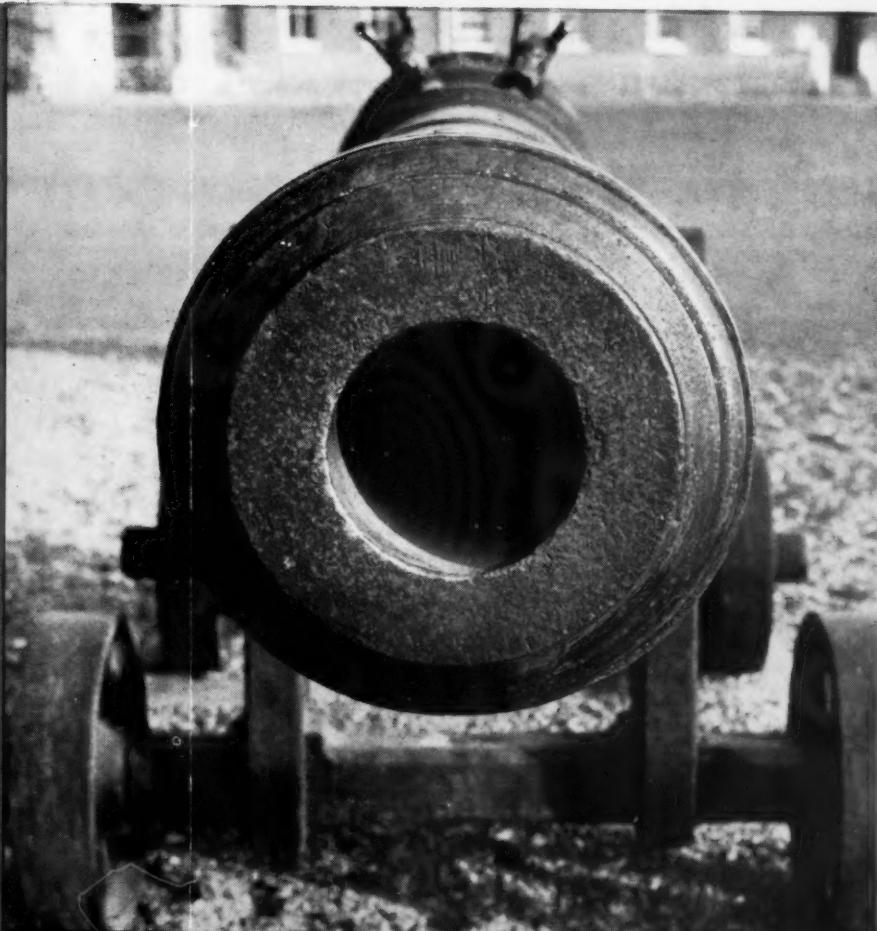
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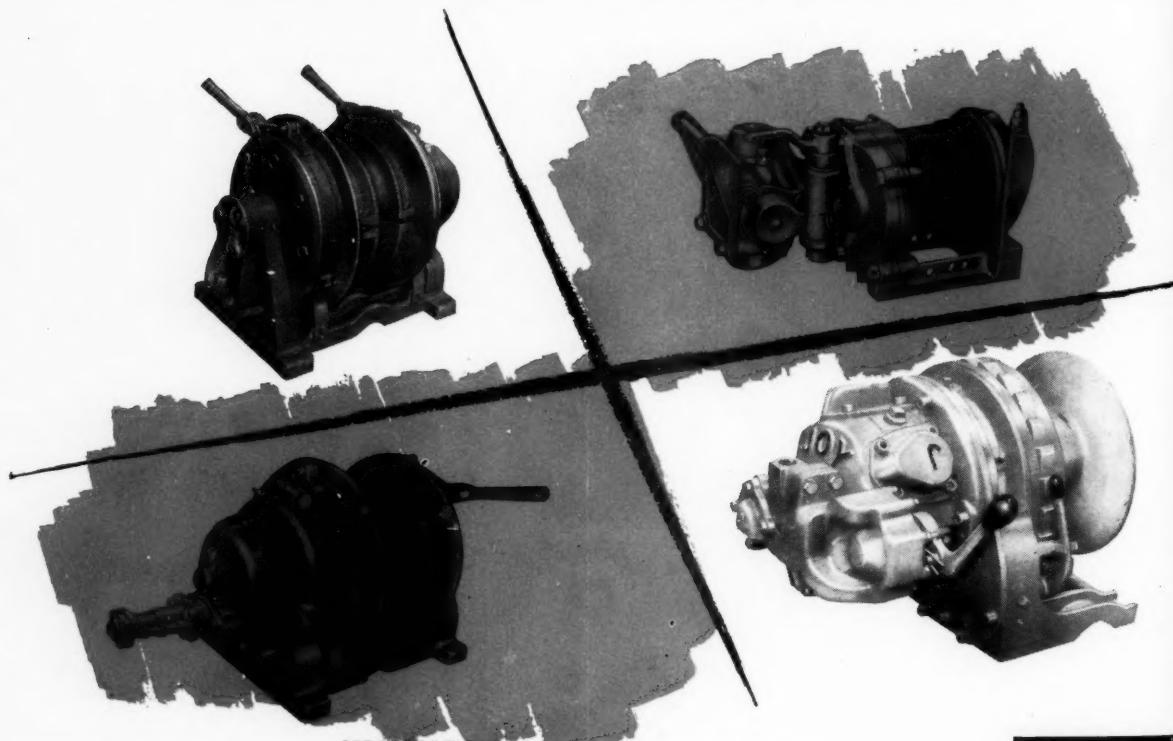


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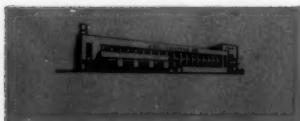
SPECIFICATIONS

Model	H.P.	Rope Pull (lbs)	Rope Speed (F.P.M.)	Rope Capacity	Weight	Overall Dimension Lth. Wdth. Ht.	Power
AV-80	0.9	750	30	286' $\frac{1}{4}$ " $\frac{5}{8}$ " $\frac{3}{8}$ "	85 lb	22" 9 $\frac{1}{2}$ " 11"	Air
EW-111	5.0	2000	70	- 520' 360'	325 lb	24" 15" 19"	Air
F-113	7 $\frac{1}{2}$	2000	124	- 1000' 700'	470 lb	24 $\frac{1}{2}$ " 24 $\frac{1}{2}$ " 20 $\frac{1}{2}$ "	Air
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The Mining Journal

London, December 25, 1959

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The Mining Industry in 1959

THE close of a year is traditionally a period for a backward glance, when an attempt is made to view in perspective the happenings of the past twelve months and determine the most significant trends. What is the verdict on 1959 as it takes its place in the annals of mining history ?

Considering the year first of all from the widest standpoint, its most outstanding feature has been a perceptible improvement in East-West relations. The lessening in international tension owes much to personal contacts between peripatetic heads of States, originating with Mr. Macmillan's Moscow mission and culminating in Mr. Krushchev's historic journey to the United States and President Eisenhower's global goodwill tour.

The cold war, however, remains conspicuously unaffected by the thaw. Indeed, it is becoming increasingly apparent that the underdeveloped countries, motivated as they frequently are by the urge for greater political freedom coupled with increased financial assistance, are the battlegrounds on which the conflict between Communism and Western Democracy will be won or lost ; and that the weapons will be not hydrogen bombs but loans and grants, not conventional armaments but the development of mineral resources and the construction of steelworks and factories, roads and dams. For the underdeveloped countries this situation is by no means disadvantageous !

Political considerations apart, it is, of course, evident that without financial and technical assistance, whether from Western or Russian sources, the underdeveloped countries are in no position to undertake ambitious programmes and projects for raising the living standards of their peoples. On the other hand, it is no less obvious that the manufacturing countries have a direct economic interest in maintaining the flow of capital to the less developed territories, whose economic expansion is essential to the continued growth of world trade.

Hitherto the burden of aid has fallen mainly on the United States, with some assistance from Britain. The vast scale of the aid programme, however, has been largely responsible for America's growing trade deficit, expected this year to exceed \$4,000,000,000 and it has come to be realised that even the American dollar is not invulnerable. While the U.S. balance of payments has continued to deteriorate, the economic and monetary strength of Western Europe has increased. It is scarcely surprising, therefore, that Uncle Sam should be seeking to spread the aid burden more widely by persuading the countries of Western Europe to participate in financing world economic development. One means by which this could be achieved is through the proposed International Development Association, which is to be set up under the management of the World Bank for the purpose of making capital available to underdeveloped areas on less onerous terms than those of other world institutions.

Washington has also announced drastic long-term policy changes in the system of American aid to Far Eastern countries.

Direct grants will gradually be replaced by loans and priority in these will be given to nations which agree to spend the loan on purchases in the United States.

It may well be that, as the Western European countries and Japan step up their foreign aid spending, the U.S. example will increasingly be followed and that the time may be coming when it will be normal for foreign aid to have strings attached. Such a development would, however, scarcely be in line with the British Government's efforts towards trade liberalization. Moreover, if these artificial canalizations of trade were to be successfully averted, it would certainly become more necessary than ever that Whitehall should recognize the need for facilitating a tighter co-ordination between the creation of the commercial opportunities which foreign aid makes available, and the realization of these opportunities through the sale of British technical know-how and capital goods in competition with the manufacturers of other countries. The latter's products are, of course, often spear-headed by consultancy services, the full cost of which is not being directly charged to the client.

The Mining Machinery Exhibition, held at Olympia, London, in July, under the auspices of the Council of Underground Machinery Manufacturers, afforded a most timely opportunity for a world-wide re-appraisal of the British manufacturer's capacity to equip speedily, efficiently and at competitive prices, almost any type of mine in any country.

For the mining industry itself 1959, like Mr. Punch's famous curate's egg, has been good in parts. For producers of the major non-ferrous metals it was characterised by a marked recovery in demand, with prices substantially higher than in 1958. Gold and diamonds also had a good year, while platinum's fortunes have taken a marked turn for the better. On the other hand, the markets for chromite and manganese ore have been slow to revive, the expansion of uranium mining has been abruptly halted, while the coal situation has gone from bad to worse.

One of the factors affecting the metal markets has been growing uneasiness as to American stockpiling policy. The Administration intends submitting to Congress a plan to revise the stockpile laws so that unneeded materials can be disposed of more easily. However, the Office of Civil and Defence Mobilization (O.C.D.M.) has stressed that it will resist "all efforts to use the stockpile as a means of influencing prices and otherwise interfering with the normal operations of the economy".

In the Communist countries the expansion of mine and metal production shows no sign of abating. At a time when the Free World mining industry was suffering from the combined effects of economic recession and excess production capacity, Russia, China and the various Eastern European countries in the Communist *bloc* have been setting up new production records, discovering and developing new mineral resources on a truly impressive scale, and raising their long-term targets to progressively higher levels.

So far as the Free World is concerned, the year now ending may be divided into two sharply demarcated phases. During the first quarter the United States, which had started the year in what might best be described as a state of economic convalescence, shook off the final traces of recession and embarked upon a period of rapidly rising prosperity, in which the demand for most raw materials was assisted by a substantial restocking movement, the latter trend being further stimulated by the approaching termination of labour agreements in the steel and non-ferrous industries. Throughout this first phase, the economies of Britain and Western Europe were still depressed by the aftermath of recession, though industrial output was slowly starting to improve.

The second phase began in July with the onset of the long and bitter standstill in the U.S. steel industry, followed a few weeks later by a nation-wide strike in the non-ferrous mining

and smelting industry, which led to the suspension of operations at all major copper mines, as well as to some loss of lead and zinc production. In both strikes the central and most intractable issue is not that of wages or working conditions, but the employers' insistence on greater authority in determining working rules. The disputes, in fact, have developed into a major showdown between management and labour, the outcome of which cannot as yet be foreseen.

This second phase, dominated in the U.S. by the steel and copper strikes, also witnessed a strong upsurge in the economies of other Free World countries. In Britain the resumption of industrial expansion was given a further momentum by the sweeping Conservative victory in the General Election of October. In Western Europe, where production is also running at a high and expanding level, interesting possibilities are presented by the emergence of two separate trading blocks—the "Six" and the "Seven"—which, it is to be hoped, may prove stepping stones to the creation of a single free trade area.

As was to be expected, copper has been particularly sensitive to the changing conditions encountered during 1959. In the first half of the year sentiment was increasingly dominated by the threat to price stability presented by excess capacity and production, which was alleviated but by no means removed by the action of some major producers in announcing output cuts, and by consumer restocking in anticipation of strikes. By the autumn, the situation had been transformed by the impact of the U.S. copper strike, which started in late July and was aggravated for a short period by the Braden dispute which at one time seemed liable to spread to other Chile mines. By the end of the year, the aggregate loss of copper from the U.S. and Braden disputes will have exceeded 250,000 tons and settlement has yet to be reached in most of the North American disputes.

For lead and zinc producers the year started on a gloomy note, the effects of excessive production and rising stocks being aggravated by the U.S. import quotas. Rather surprisingly, after the failure of earlier conferences to achieve any practical results, a meeting held under U.N. auspices in May resulted in voluntary curtailments of production and sales by various countries.

These measures proved particularly effective in the case of zinc. The reduction in supplies, coupled with unexpectedly large gains in consumption, have resulted in a tight supply position and prices have recovered to some £95 a ton. This suggests the possibility that at the meeting of the U.N. Zinc and Lead Committee in January the voluntary cutbacks may be rescinded or relaxed. Lead's basic position, however, still remains one of over-availability.

The past year has been a particularly notable one for tin, for it witnessed the triumphant emergence of the I.T.C. from the flood of adversity which at one time seemed almost beyond control. Through the combined effects of Draconian quota restrictions, buffer stock purchases, reviving consumption, and a greatly diminished flow of Russian tin, supply has been effectively equated with demand. Throughout 1959 the Buffer Stock Manager has on balance been a seller of tin and it would appear that, latterly, his chief preoccupation has been to keep the price from exceeding £800. Fears that a sudden resumption in U.S. demand might tend to push the price above this level may well have been the chief factor governing the I.T.C.'s decision to fix export quotas for the first quarter of 1960 at 36,000 tons, as compared with 30,000 tons over the last quarter of 1959 and 25,000 tons over the third quarter. The new figure represents more than 95 per cent of the producers' capacity. The present tin agreement expires in mid-1961 and already the I.T.C. is drafting the second agreement which most sections of the industry hope will follow—given the continued benevolent neutrality of the Americans and a satisfactory understanding with the Iron Curtain countries.

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U.S. aluminium producers have made great strides in recovering the ground lost during the recession, a notable feature of the year's operations being a clearly defined increase in commercial demand. In Britain and Europe, demand has been slower to revive and until quite recently the difficulties of Canadian suppliers were aggravated by competition from lower priced metal from Eastern European sources. That the situation in Europe and elsewhere is now improving is indicated by the increased prices for ingot announced by North American producers towards the end of the year and by Alcan's recent decision to increase its total aluminium production by 33,000 l. tons to 595,000 tons annually, or about 77 per cent of capacity.

The year was also notable for two important events which have given American producers a big stake in Britain's aluminium industry. The first was the struggle between Alcoa on the one hand and the Reynolds Tube Investments combination on the other for the control of British Aluminium, the Anglo-American partnership finally emerging victorious. This development was followed by the announcement early in July of an agreement between Alcoa and Imperial Chemical Industries, which provided for the formation of a jointly owned holding company called Imperial Aluminium to take over I.C.I.'s Waunarlwydd plant.

Nickel, despite the American steel strike, made satisfactory headway in 1959, both quantitatively in terms of rising consumption and, of still greater importance in the present circumstances, in developing new or expanding outlets.

The gold mining industry has also had a successful year, notably in South Africa where production and dividends reached new peaks, an unusually ample supply of African labour contributing not a little to the good results.

Perhaps the most notable feature of a notable year in South African Gold mining, however, was a sudden spate of prospecting activity. Stimulated by the decline of the old Witwatersrand mines, and triggered by heavy cash positions in the Houses' balance sheets, the present gold search is outstripping in magnitude and intensity even the great gold rushes of history—at one time more than sixty drills were in operation.

While on the subject of gold, mention should also be made of the various bullion purchase schemes which have come into operation since the autumn of 1958, when the sale of gold bars was pioneered by the Toronto Stock Exchange. Their main appeal is to the investor who wishes to protect himself against a flight from currency without incurring the risks attached to buying gold still in the ground. In the latest of these schemes, certificates are to be made available at values ranging from about £21 for a 50 gram bar to £420 for a one-kilo bar and will take the form of bearer bonds, making them anonymous and completely transferable. In effect, the new certificates are thus a form of currency fully backed by gold.

The diamond industry, after a year of (overall) lower sales in 1958, has again been setting up new quarterly records for sales of both gems and industrials. The highlight of the year, however, both as a brilliant technical achievement and for its potential market implications, was the announcement that De Beers had developed a method of making synthetic industrials of the same type as those manufactured by the U.S. General Electric Co. Mr. Oppenheimer has expressed confidence that it would be technically and economically possible

for the company to proceed to manufacture on a commercial scale, but no decision in this matter has yet been taken.

Under the shelter of long-term Government contracts on favourable terms, uranium production has been expanded at a rate to which that over-worked word "phenomenal" could aptly be applied. It has become increasingly apparent, however, that demand was rising too slowly to absorb the rising output and that earlier estimates of future requirements had been unduly optimistic. Both the U.S. and U.K. Governments are now heavily overbought and present indications point to the building up of an excess supply during the period 1959-64 which should, however, be absorbed by the early 1970's as civilian demand expires.

The expansion of South African production has already been limited by the ceiling of 6,200 tons of uranium oxide a year imposed in 1958. Canadian producers, however, were hopeful that the Atomic Energy Commission would take up its options to buy additional Canadian uranium when existing contracts expired in 1962 and 1963, but the A.E.C. has formally announced that these options will not be exercised. In order to prolong the profitable life of the industry, the Canadian Government announced a plan to "stretch out" deliveries of uranium to the U.S. and Britain by offering Canadian producers the opportunity to realign contracts, either by mergers or by the purchase of contracts from other companies not in a position to fulfil them. Deliveries of the purchased contracts would be made after completion of the buyer's own contract and up to December 31, 1966. So far, the reception of this plan by the Canadian uranium industry has been very mixed. In recent weeks there have been indications that a similar stretching out of South African contracts may occur.

Coal stocks continue to rise. In the European Coal and Steel Community they amounted at the end of October to 32,844,000 tonnes compared with 24,282,000 tonnes a year earlier. In Britain, where a similar situation prevails, a Bill currently before Parliament raises the overall borrowing limit of the National Coal Board to £700,000,000. There is some reason to hope that the steps currently being taken by the coal industry itself, coupled with the revival in heavy industry, will be reflected by a healthier relationship between supply and demand.

Under the combined stimulus of space rivalry, aircraft development, and nuclear programmes, the newer metals continue to forge ahead—none more rapidly than beryllium, for which new and exciting potentialities are foreseen. British interest in this promising metal was demonstrated earlier this year by the formation of Consolidated Beryllium Ltd., owned jointly by the Imperial Smelting Corporation and the Beryllium Corporation, which plans to erect the world's largest beryllium metal plant.

Another notable development in the same field was the commissioning by Imperial Chemical Industries Ltd. of Europe's first wrought beryllium plant, which is capable of producing seven tons a year of metal, valued at about £160 a lb. Britain's progress in the beryllium field is further indicated by the announcement of a "know-how" agreement between the Chesterfield Tube Co., a subsidiary of Tube Investments Ltd., with the U.S. company, Superior Tube, which provides for a full exchange of technical "know-how".

"The Mining Journal" sends to all its readers everywhere best wishes
for a Happy Christmas and a Prosperous New Year

Peru Seeks Mining Capital

PERU has a surface area of 1,295,155 km.², being the third largest country in South America; she is bounded to the north by Ecuador and Colombia, to the east by Brazil and Bolivia, to the south by Chile and to the west by the Pacific Ocean. The population is 9,800,000.

Means of Communication

Peru possesses two principal railway systems into the interior : one of these, in the central portion of the country unites Callao and Lima with Cerro de Pasco, Huancayo and Huancavelica, and the other, in the south, runs from Mollendo and Matarani to Arequipa, Puno and Cuzco. There is also a railway from Chimbote to Huallanca, in the Callejon de Huaylas (Ancash), and various lines along the coast joining the valleys with the different ports.

Peru has one of the best highway systems in South America. There is the Panamerican Highway, which is completely paved and which permits comfortable travel and efficient transport of heavy materials from Tumbes to Tacna. Also there is the cross-country sierra road from Puno to Cajamarca, which is complete except for very short stretches. Furthermore, there exist roads into the interior, from the costa to the sierra, in all the departments of Peru which embrace these two zones.

There is a highway into the jungle to the highest navigable point of the Amazon River system, and at least two others will be completed shortly.

Peru possesses a net of airports throughout the whole country, covering the costa, the sierra and the montaña.

Potentialities in Peru for the generation of hydraulic power are immense by reason of the abundant supplies of water and also the mountainous conditions. At the same time, oil and coal are available for the generation of thermo-electric power.

Mineral Deposits

Peru is fortunately situated with respect to the existence within her borders of all types of metallic and non-metallic substances. Mineral deposits are mainly found in the sierra, but they also exist in the costa and the montaña. Peru produces 22 metals: Gold, silver, copper, lead, zinc, arsenic, antimony, bismuth, cadmium, tin, indium, mercury, iron manganese, molybdenum, tungsten, thallium, selenium, tellurium, vanadium, nickel and cobalt ; she also produces 22 non-metallic mineral substances : Coal, sulphur, lime, cement, salt, gypsum, mineral waters, common clays, refractory clays, barium sulphate, gravel, prophylite, silica, manganese sulphate, talc, diatomaceous earth, borax, quartz, kaolin, mica, asbestos and saltpetre.

Peru is the world's largest producer of bismuth and vanadium, the fourth largest of silver, the fifth of lead and zinc, the tenth of copper, and the twelfth of gold. The principal metallic production is represented by lead, copper, zinc, silver and gold.

Gold is obtained either from deposits where it is the principal product, or as a by-product in the exploitation of copper or lead-zinc. Deposits of gold are to be found in the costa, the sierra and the montaña ; they are found in gold-bearing pyrites, in veins of gold with silver, in veins of gold with copper

From a survey by Mario Samane Boggio, Dean of Facultad de Mineria de la Universidad Nacional de Ingeniera del Peru

and in veins of gold-bearing quartz, in pannings and monitors.

Silver is generally found associated with lead, in silver-bearing galena with copper and with zinc.

Deposits of lead and zinc are abundant in Peru ; the reserves of these two metals can be considered as being amongst the largest in the world. Deposits with assays of 3-5% of Pb, 4-8% of Zn, 2-8% oz./t. of Ag, 0.5-1.5% of Cu and 1-3 g./t of Au, exist in great numbers and with great possibilities in the matter of mineral reserves. The principal problem concerning the development of these deposits is the construction of access roads. Generally speaking, in these deposits, lead is found associated with silver in silver-bearing galena, zinc in the form of sphalerite, and copper associated with gold in gold-bearing chalcopyrite.

Copper is found in veins, lodes and in bodies associated with silver and gold, in the form of sulphur (chalcopyrite, copper sulphide bearing arsenic), as well as in the form of oxides and carbonates and in porphyry deposits ; in these latter respects there are interesting possibilities.

There exist large and interesting deposits of iron-ore ; some of these, such as Marcona are being exploited, and others are in the process of exploration.

Furthermore, there are deposits of mercury, manganese, nickel, cobalt, tungsten, molybdenum, vanadium, bismuth, arsenic, antimony and others, in the various regions of the territory of Peru.

Amongst the non-metallic substances can be mentioned oil, asphalt, coal (anthracite, bituminous and peat), sulphur, quartz, mica, asbestos, amianthus, barite, limestone, dolomite, gypsum, salt, gems, boron, saltpetre and guano.

Mining Legislation

Under the existing mineral laws sub-surface mineral substances are the property of the State, which grants concessions in accordance with the respective legislation. Up to the year 1900, such concessions were granted in agreement with the Ordenanzas de Nueva España, and then, up to the year 1950 in accordance with the Código de Minería of 1900. Since this date (May 12, 1950) matters have been ruled by the Código de Minería of 1950, which is a most liberal and progressive instrument. The Código de Minería Peruana was conceived to foment and promote the exploitation of the mineral riches of the country, and consists of a harmonious integration of the laws concerning constitutional rights, taxation, social benefits, administration, procedures, commerce and registration, and it is complemented by the necessary technical dispositions, all of which renders it capable of promoting a real economic and social transformation in Peru.

The fundamental characteristics of the Código are as follows:

All metallic and non-metallic substances can be the subject of concessions to Peruvians or foreigners for a period of five years for exploration, and indefinitely for exploitation. For the purpose of such concessions, no distinction is drawn between metallic and non-metallic substances, and neither is any distinction made between Peruvians and foreigners. Freedom of exploration is established on public or private, unfenced, land. The only exceptions to the Código are oil, radioactive materials, guano and common salt, all of which are subject to special legislation. For the purposes of the concession, either agricultural or untilled land can be used, subject to payment of compensation for damage, if any. Facilities are given for the expropriation of the water necessary for domestic or industrial purposes. Facilities are also granted for the establishment of rights for the installation and passage of canals, tanks, piping, lighting systems, power, radio, etc.

From the taxation aspect, freedom is granted in the matters of export duties, unemployment levy taxation, excess profits tax, etc., which means that the only taxation levied is the tax on profits, according to the following scale :

7% on profits not exceeding	S/. 10,000.00
10% in excess to	" 30,000.00
12%	" 50,000.00
15%	" 70,000.00
17%	" 100,000.00
20% everything in excess of	" 100,000.00

A payment on account of this profits tax is made at the port at the moment of despatch, of 4% and 2% of the metallic or non-metallic value, respectively, of the product which is being exported ; if any excess payment is made, this is returned at the end of the year. (Article 50 of the Código.)

The concessionnaire is able to make a reserve for depletion free of taxation and of free disposition, of up to 50% of the net profit obtained. (Article 54.)

The State undertakes not to vary the present rate of taxation for 25 years. (Article 53.)

Where marginal deposits are exploited the Government is able to sign contracts with the concessionnaire in accordance with which the rate of taxation can be reduced down to 10%, in addition to the granting of other facilities. (Article 56.)

In accordance with Article 240 of the Código, the concessionnaire can construct means of communication to his deposits, charging the costs of these against the profits tax.

All machinery, equipment, and materials imported for the mining industry enjoy freedom from import duties. (Article 242.)

As a consequence of this new mining policy, from the year 1949 to 1956, production of the principal metals has shown the following increases :

Lead	100%
Zinc	136%
Silver	111%
Copper	64%
Gold	71%
Tungsten	509%

Factors Favouring the Investment of Capital

These may be summarized as follows :

1. An excellent Código de Minería which renders the country, from this point of view, the most liberal and progressive in the Americas, and perhaps in the world.
2. No form of restriction upon foreign exchange operations, or the remittance of such exchange out of the country.
3. A complete absence of any nationalistic tendencies.
4. Political and social stability.

5. A favourable atmosphere for the foreign investor.
6. No distinction between Peruvians and foreigners in the matter of taxation, and equal opportunities in the question of securing mining and other concessions.
7. Stimulus and guarantees for private industry.
8. The existence of all classes of minerals and material resources.
9. A favourable attitude on the part of the Government towards the foreign investor.
10. A diversified economy.

Financial and Technical Assistance

There exists in Peru a Banco de Fomento for the mining industry, with a capital of S/. 200,000,000.00, which extends efficacious assistance to small and medium-sized mining enterprises, granting credits, and making available plants for the processing of minerals.

The Mining Faculty of the Universidad Nacional de Ingeniería trains mining engineers, who are well qualified and of great use to the industry. This same university also trains civil, mechanical, electrical and chemical engineers, all of whom lend their services to the mining industry. The Geology School of the Universidad de San Marcos trains geologists. Also the State itself, through the Escuela de Artes y Oficios, trains craftsmen and foremen to assist the engineers in the industry.

The Instituto Nacional de Investigación y Fomento Minero is continually serving the mining industry through its experimental plants, laboratories, meetings, museums, libraries, statistics, publications, etc.; this organization also makes geological and mining studies throughout the whole country, and these are all placed at the disposal of the mining industry.

The Sociedad Nacional de Minería, the Instituto de Ingenieros de Minas del Perú, the Sociedad Progreso de la Pequeña Minería, the Sociedad Geológica del Perú, the Sociedad Geográfica de Lima, the Instituto Geográfico del Perú and the Junta de Control de Energía Atómica all render scientific, technical and professional service and assistance to the industry.

There exist in Lima laboratories and the private offices of mining engineers, metallurgists, geologists, etc., all of whom render services to the mining companies which are interested in prospecting and exploration.

Needs of the Peruvian Mining Industry

The mining industry in Peru requires capital, technical assistance and the establishment of foundries and metal refineries in order to complete and assure its future development. The conditions and requirements for investment already exist, and it is therefore only necessary for the foreign investor, or his advisers, to study the actual conditions in Peru and substantiate the favourable factors existing for successful and secure investment.

The investment of capital in the Peruvian mining industry can be, and should be, made in all the phases of its operation; the prospecting and exploration of new regions; the development and exploitation of partially explored zones; exploitation of areas already known; the installation of processing plants and of power-houses; the installation of foundries and refineries; the purchase of minerals, concentrates and other metallurgical products; land and sea transport of mineral products, etc. In all and each of these phases of the mining industry successful investments can be made, either by the foreign investor himself, or in formulae of association with Peruvian miners or investors.

ROLE OF THE U.S. BUREAU OF MINES IN 1979—I

THE Bureau of Mines of the Department of the Interior is a relatively small Government agency—having an operating budget of about \$27,000,000 a year. It is essentially a technical organization, employing about 4,300 people, of whom more than 1,200 are scientists and engineers. About two-thirds of our appropriation is for conservation and development of metal, mineral, and mineral-fuel resources, and one-third to carry out a health and safety programme including coal mine inspection.

Stated in the broadest terms, the Bureau's objectives are to assure the nation's supply of mineral raw materials and to advance health and safety in the mineral industries.

The official statement of Bureau programme objectives reads as follows:

"The objectives for domestic mineral resources including fuels may be enumerated as: (1) Wise production and utilization of United States resources; (2) discovery and development of new sources of supply; (3) maintenance of reserves and stocks at adequate levels; (4) fostering of a productive capacity large and flexible enough to exploit effectively the available resources to the full extent of foreseen requirements; and (5) assurance of access to foreign supply to supplement domestic output where necessary. In addition, Government and domestic industry have an interest in foreign resources paralleling that in domestic resources, although it is usually less acute."

Elements of the Bureau programme to seek to attain these objectives are then discussed in the formal Bureau programme statement under seven categories: (1) Appraisal of mineral position; (2) research; (3) mineral-industry studies; (4) development of submarginal resources; (5) possible new or wider uses for abundant resources; (6) substitutes, and (7) conservation.

World War II, and the period of vigorous industrial rebuilding and expansion, and of the international tension that followed, combined to bring about dramatic changes in the nation's mineral needs. There was accelerated demand for most minerals. Whole new mineral industries were created—some based on metals or minerals that had been little more than scientific curiosities a few years before.

These changes have called for a constant redirection of the Bureau programme among mineral commodities. For example, coal research emphasis recently has been shifted from underground gasification to hydraulic mining and the coal-fired gas turbines. Health and safety hazards in mining, processing, and use of radioactive materials are receiving increasing Bureau attention. Demand for superior high-temperature engineering materials has led to expanded research on processes to produce high-purity metals. As the impurities are reduced, quantitative analyses become more difficult—calling for a shift of funds to seek out better analytical techniques.

As various oil fields have tended toward depletion, added research has been undertaken on improved techniques of secondary recovery methods. Discovery of rare-earth-elements resources led to research to find processing methods and uses for these unusual metals.

The need for a concerted minerals policy for Britain and the Commonwealth enhances the interest of an address by Marling J. Ankeny, director, Bureau of Mines, U.S. Department of the Interior, which was presented at the annual meeting of the American Society for Engineering Education, Pittsburgh, Pennsylvania, on June 16, 1959. This is an abridged report of Mr. Ankeny's address, presented in two instalments.

What changing circumstances do the next 20 years hold? What minerals problems will face the nation in 1979?

As problems become more difficult and the consequences of poor judgement more costly, the need for accurate complete information gains significance. Advances in military science are likely to enlarge the number of strategic minerals and increase the importance to defence of a dependable supply of these materials. Wise planning by industry and by Government to ensure the economic well-being and the security of the United States will demand that reliable current information on the mineral position of the United States and other countries is known.

It seems inevitable to me that in 20 years the Bureau will be required to gather, evaluate, and disseminate much more mineral-industry and mineral-supply information than we do today. These facts will be needed so that businessmen, law-makers, and Government administrators can carry out their responsibilities.

As Director of the Bureau of Mines, I am particularly aware of the expanding need for the type of factual information on minerals that I refer to. As I have pointed out, our role is not only to solve mineral problems—we have also the frequently more difficult tasks of recognizing and defining the problems, of measuring their magnitude, and of weighing individual problems against one another to select those that merit attack by Bureau research teams. Our assessment must take into account such important and diverse aspects as potential sources of mineral supplies; probable scientific and technological advances; changes in population; and social and political changes that influence mineral consumption *per capita*. These and other factors will be vastly more complex in 1979 than they are now.

Research

Now to turn to "research", the largest single area of Bureau activity today. Technology has been heralded, rightfully I believe, as the principal means by which mankind can meet the expanded material needs brought about by an increasing population and a rising standard of living. And I am convinced that the Bureau's research programmes will continue to play an important part in helping to fulfil these needs.

The sources of mineral production and mining methods are two of the most conjectural and, in many respects, interesting areas for prophecy. Depending upon whether you inquire of an astronaut, an oceanographer, or a geologist who likes to

summer in New England, you will find that mineral resources of the future may be obtained by capturing asteroids, from deposits at the bottom of the sea, or by simply mining in Vermont. I am not fearful that 20 years hence we will be faced with the immediate need to decide between these alternatives to assure our minerals supply. But I would be hesitant to proclaim that these and other equally or more fantastic concepts will not be more widely accepted in 20 years than today, and I suspect that some of the research we will be doing will be in areas that many responsible scientists today believe to be unlikely or even whimsical.

Mining at Increasing Depth

Along more conventional lines, the mining of small, deep, steeply dipping mineral deposits, especially in hard rock, has been particularly resistant to technological improvement. Nevertheless, the richness of such deposits will continue to invite exploitation. Furthermore, improved exploration techniques should reveal hitherto unsuspected deep deposits, such as the recent iron-ore, lead, and copper discoveries in Missouri.

So despite the impressive trend toward surface mining in recent decades, it seems more than likely the quantity of ore won from underground operations will be greater in 20 years than today. As man digs deeper into the earth the intensity of many problems increases. To enable use of deeply buried mineral resources will demand increased research of many types. There will be greater need to measure before mining the rock characteristics and the boundaries and grade of ore—so that the mining process can be carefully planned in advance.

A better understanding of rock mechanics will be required to assure ground control. Ventilation and air conditioning will be more costly and ultradeep mining may depend upon revolutionary concepts to allow men to work. Greater problems in communications and in transportation will have to be solved.

Advances in mining often are brought about because of a confluence of ideas, or of ideas and the materials or types of equipment to carry out these ideas. Just as the aeroplane awaited development of a lightweight powerplant for its practical realization, rock bolting, which had been done intermittently for perhaps 40 years, was not widely used until mechanical coal mining made it particularly advantageous.

Mining research engineers of the future will require not only a knowledge of the conditions of mining, but of new materials and new possibilities of mechanical attack that become available. Better exploration and development techniques will become possible as different types of drilling or rock breaking are developed. A different type of mining problem that seems likely to grow in magnitude over the next two decades is that of restoring or preventing damage to land surfaces by mining, particularly of coal or of sand and gravel and stone for aggregate purposes. Aggregates are needed largely in heavily populated areas where the land surface is likely to have both commercial and aesthetic value.

Mining to date often has followed in the wake of developments by road builders and major dam construction in the use of earthmoving equipment and of accepted equipment designed for these other purposes. The need to correct land-surface damage, combined with the need to move enormous tons of overburden in the strip mining of deposits, may well combine to make earthmoving one of the major mining costs. The Bureau will unquestionably have a growing role in improving the techniques to mass mine surface deposits inexpensively.

Mining of mineral fuels and solution mining offer special opportunities for research in which the Bureau will have an expanding role. Greater efforts will be expended to maintain underground pressures in oil pools. Serious consideration already is being given to use nuclear explosives to fragment oil shale or oil sands in place as a first step in extracting oil. Gasification in place and hydraulic coal mining are both research areas that may be receiving greater emphasis 20 years from now. The handling of ocean water, brines, and of water or other chemicals used in solution mining will create additional problems facing mining research.

The role of the Bureau of Mines in metallurgical research in the years ahead has many interesting facets. Just as the mining engineer is faced with the problem of holding costs down to enable profitable mining of large low-grade deposits, metallurgists not only will have to beneficiate huge quantities of ore but will be compelled to improve percentage extraction as the grade declines.

Another metallurgical problem area that seems destined to grow is that of recovering by-product minerals that may occur in minor quantities in ores. Advanced research on physical and chemical separation processes will be necessary, as many deposits may be commercially unworkable if their minor constituents cannot be extracted economically.

The problem of refining minerals also will grow in the future. The desirable characteristics of some superpure materials, particularly metals, will call for regular commercial production of these elements in the future. In addition, the preparation of special alloys for many uses demanding the very highest of engineering properties will require that superpure elements be available so that rigid control can be attained in alloy manufacture.

Preparation of pure elements already has thrown heavy demands upon the analytical chemists. The need for fast, accurate analytical and process-control techniques will unquestionably become greater. I visualize that the Bureau will have a substantial role in this field. We already have discovered the need for research-type analysts to measure the progress of our research on refining processes.

Utilization Research

Another research area in which the Bureau will have an expanding role is that of physical metallurgy and utilization research. Not only will the growing need for precision in measurement of the physical properties of materials call for added research, but there will be greater demand for research to determine the factors that influence properties as an aid in developing improved materials.

Advance of the machine age has seen an ever-growing reservoir of mineral-based materials in use in machines and equipment. There also is an increasing, circulating load of waste materials both in processing plants and from equipment that has been worn out or become obsolete. The importance of new and old scrap materials to the economy is expanding and, accordingly, the Bureau's role in research to enable economic recovery of minerals in scrap will become larger. The problems of using scrap not only will gain in magnitude in the years ahead, but are likely to become more complex because of the discovery of attractive alloy compositions requiring small proportions of numerous metals.

Another growing research role of the Bureau in the nuclear age will be to make full use of advances in nuclear technology to improve mining and mineral processing. Studies are now being considered as to how to use the nuclear explosions for the mining process.

COBALT—I

SMELTING COBALT

REERENCE to the secrecy maintained by different producers throughout the world has been made by standard authorities—Schnabel, Liddell, Hofman, and others, and a quotation by G. C. Mutch, of Metallurgical and Chemical Corporation, Mattawan, is as follows:—

"As a result (of secrecy) the industry has suffered somewhat by being deprived of the interchanging of ideas, and the mutually helpful discussions that are the custom among copper smelters". In the comparatively few detailed accounts of smelting procedure available, the processes described frequently relate to collecting the cobalt in speiss, or speiss-matte, which appears to have been reiterated in different publications. While methods of the kind may suit the type of ores, concentrates and residues handled by some of the large smelters on the American continent, they are not expressly desirable for handling other forms of these materials.

Private Research

Several of the steps essential where arsenic predominates can be dispensed with, and the work generally speeded up where this constituent only appears to a limited extent. One concern engaged on smelting nickel and cobalt ores on a large scale made its reputation by the economical means adopted for initial handling, which resulted in concentrates from outside firms being refined to enriched condition for return to the respective owners, who then applied their own ultimate separation methods. (This corresponds to what is known as the "customs" smelting arrangement in the U.S.A.)

Despite this apparent co-operation between different undertakings, the methods adopted were nevertheless maintained strictly private, but in any case, the materials dealt with were widely variable, and included earthy cobalt or wad from the outcrop of cobalt ore deposits, concentrates containing cobalt-nickel pyrites, cobalt glance, collected concentrates from tin smelting, and sludges from wet copper extraction processes. The main source hailed from New Caledonia, and contained 3 per cent cobalt, although ultimately falling to 1.5 per cent, to which these other materials from outside sources were added. Due to the close proximity to nickel deposits, much if not most of the materials contained slightly more nickel than cobalt, and a frequent composition approximated to 4 per cent nickel and 3 per cent cobalt. Unlike the richly argentiferous Canadian products, which were stated to contain up to 800 ounces of silver per ton when concentrated, only a few ounces per ton appeared from the former source, and with relatively little arsenic. Hence, as distinct from running the charges to form a speiss-matte, the effort was to smelt to a cobalt-nickel matte, and although this contained a small percentage of arsenic, it did not conform to a speiss-matte in the proper sense of the term.

By C. C. DOWNIE

Nature of Reactions Involved

The fact that the speiss and matte can be formed as two distinct layers, since they possess different specific gravities, appeared to attract much attention in earlier years, as this afforded a means of initial separation. As has already been pointed out, mattes usually contain a higher ratio of cobalt to nickel than speiss formed at the same time, and if the ratio of cobalt to nickel in the charge is 2 : 1, then the ratio of cobalt to nickel in the matte will usually be greater than 2 : 1, and in the speiss the ratio will be less than 2 : 1. By this earlier system, which is evidently persevered with to the present day in some quarters, the effort was to make as little matte as possible, and rather work for a speiss-matte. When working nickel-cobalt ores and residues, to which outside or purchased concentrates are included, whether or not these contain appreciable arsenic, the improved process is to operate in the opposite direction, and form a refined matte with little or no speiss.

For the benefit of students, much has been made of the pyro means of separation possible in using arsenic and sulphur for isolating zinc, iron, copper, nickel, and cobalt. To simulate this on the large scale, however, involves protracted and circuitous roasting methods, although otherwise easily carried out in the laboratory. By dint of directly reducing arsenic, the advantages are both economical and time-saving. Although heating rich arsenical materials at 400 deg. C. in presence of air introduces a form of "self-roasting", this is relatively slow, but the ultimate roasting at from 850 deg. to 900 deg. C. is still slower, and is in fact the slowest roasting process on record; i.e. if the vast majority of the arsenic is to be removed.

Evidently the fear of exposing cobalt arsenides to oxidation whereby the cobalt might pass to the toppings did much to discourage interest in converter practice, but this improved system is direct and rapid, and forestalls the elaborate roasting and its attendant pulverizing of the mass, and only the concentrated or refined matte with its small arsenic content requires grinding and roasting, which latter is sometimes unnecessary. Earlier speiss compositions elsewhere shewed upwards of 25 per cent arsenic, which required to be roasted down to around 10 per cent to suit the iron content. Iron and arsenic contents had to be held to a fixed ratio to facilitate subsequent precipitation of ferric arsenate in the ultimate wet separation process. Total elimination of this arsenic is literally impossible by roasting methods.

Smelting Procedure

Regarding the initial smelting, although electric furnaces can readily render all refractory materials in the charge fluid, the costs for current consumption alone are usually much higher than where the coke-fired blast furnace is used, while the electrodes are unduly corroded by the volatile constituents. Equipment of this kind has been installed at the mine-heads in New Caledonia, but this is largely because of transport difficulties with coke and attendant materials, and the ease of acquiring electric current from nearby hydroelectric schemes. Elsewhere, in view of the multifarious character of cobalt ores and residues, provisions are made for

ORES AND RESIDUES

the blast furnace to attain the highest possible temperatures, particularly since oxides of magnesium and chromium, besides other refractory oxides, are liable to be present.

Cokes from this country (the U.K.) did not give the desired high calorific value, and seldom exceeded 6.700 B.Th.U. whereas those imported from Silesia held a B.Th.U. value of 7.100, and from Westfalia upwards of 7.050. Selection of cokes had to be made in conjunction with their density per cubic yard, and volume in cubic feet per ton, in order to acquire an indication of their position within the hearth.

A much greater water-flow is necessary for the water jackets to keep them cool, approximating to 0.6 gallon per minute per square foot of jacket area, which is about the highest on record.

Treatment of Charges

The charges were worked in hearths of both 50 and 100 tons per 24-hour day, the first of which was operated with a blast of 160 cubic feet per minute per square foot of hearth area, and the latter one of 300 cubic feet. For some time two 50-ton furnaces were used, each of which had a hearth area of 19 square feet, these being operated from a common fan supplying 6.000 cubic feet per minute. The refractory nature of many charges necessitated the greater blast, but too fast working did not allow sufficient time for the reactions to be properly completed, and hence the blast had to be altered from time to time.

The charges were first made into briquettes, the moisture content of which required careful control, since not a little of the wad or earthy cobalt retained variable moisture percentages. Part of this was dried in a kiln and spread out on a stone-flagged floor, together with dry material and fluxes, all of which were mixed, finely pulverized in pan mills, and passed through the briquetting presses. The variable nature of the by-products included necessitated a more or less continual alteration of the composition of these briquettes, and to facilitate easy fusion, proportions from different ore parcels were marked off and allocated to each charge. If this is not attended to properly, there is the risk of the charge caking within the hearth.

Likewise easily fusible fluxes, which sufficed for alternative smelting practice, tended to run off without doing useful work, and even soap works waste, and alkali waste, which were included in nickel ores, garnierites and dunites, etc., had frequently to be supplanted, at least in part, by barytes.

Charges of 30 cwt. of prepared briquettes required upwards of 10 cwt. of coke, while ores of not too refractory a character were made into briquettes with 8 per cent barytes, 5 per cent coal, and 3 per cent lime.

The smelting and initial treatment of cobalt ores and residues constitutes a problem which has been somewhat sparsely dealt with in the little literature that has appeared on the subject generally.

This article will be concluded in a subsequent issue.

Unlike mechanical charging with nickel ores, hand-feeding is preferable in order to keep a closer control on the progress of the fusion. The slag runs out continuously to a water pit for granulation and, when foul, requires special treatment to reclaim the cobalt values. With good working, the matte is tapped 10 times per 24-hour shift, or approximately every 2½ hours. It comprises a cobalt-nickel matte containing a little arsenic, but is not a speiss-matte, and is purposely tapped with a lower content of these metals than where garnierites are handled.

While the sequence of processes or reactions is direct and straightforward where one variety of ore is handled, various contingencies can arise to upset reaction relations when other materials are included. (Without making the subject appear unduly complicated, four provisions are resorted to where the matte is not suitable for immediate converter treatment, which need not be entered into here.)

Improved Converter Practice

As distinct from smelting garnierites which contain some 8 per cent nickel, and which are produced as a 30 per cent blast matte, to be run directly into the converter, the cobalt-nickel matte contains approximately 15 per cent of these two metals combined, in the ratio of about 4 to 6 per cent cobalt to 9 to 11 per cent nickel.

Instead of tapping from the furnace spout to the converter, the cobalt-nickel matte is run along a lengthy chute made from refractory-lined boiler plates, to the converter some 60 feet distant.

The initial blowing in the converter is accompanied by a voluminous evolution of smoke and fume, and as the material is much weaker than the rich nickel matte proper, this evolution continues much longer. For this reason, the air pressure is purposely started low, and rarely exceeds 4 lb. per square inch of tuyere area, but is increased as the process proceeds. The attendant in charge follows not only the colour and behaviour of the flames emitted, but the characteristics of the particles thrown out, which although usually black at the commencement, show different colours later. As distinct from nickel converter refining, the process is not carried to completion.

ANALYSIS OF COKE USED

	Carbon	Hydrogen	Oxygen	Nitrogen	Sulphur	Water	Ash	Carbonaceous matter	Heating value (in calories)	Volume occupied (in cubic ft. per ton)
1.	86.4	0.5	0.8	1.2	1.0	3.7	6.4	89.9	7111	81.7
2.	84.5	0.7	2.7	1.4	0.9	1.8	7.3	90.8	7057	94.5
3.	82.9	1.0	1.6	1.0	1.4	1.8	10.3	87.9	6936	94.5
4.	80.7	0.8	2.9	1.5	1.1	1.7	11.3	86.9	6695	90.0

Sources: 1. Silesia. 2. Westfalia.

3. Saar District. 4. British foundry coke.

Machinery and Equipment

New Stable

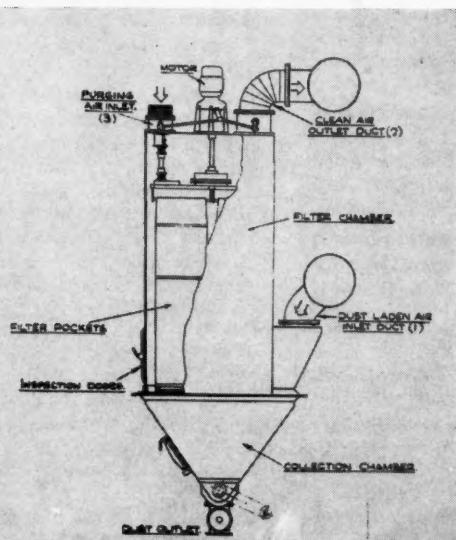
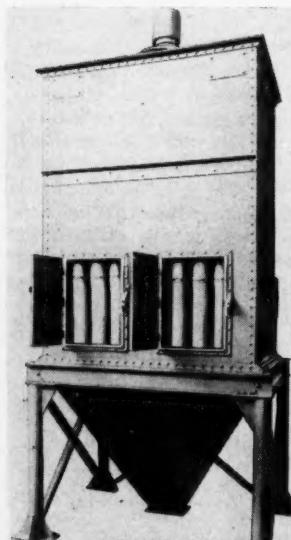
Hole Conveyor

The stable hole conveyor manufactured by Richard Sutcliffe Ltd. has been designed for the maintenance of stable holes in advance of the coal face, and for the reduction of the manpower required to remove coal, etc., at this point. Easily transported, it can be used wherever coal or stone has to be moved short distances in confined spaces.

The conveyor is designed to use an 18 in. wide belt. It is driven at the tail end by a combined electric motor and drive pulley assembly, and at the delivery end by a tensioned return pulley. The frame is fabricated from mild steel sheets which form a trough for the top belt and at the same time provide complete protection for the bottom belt. A hopper is fitted at the loading end to receive the material and removable spill plates are fitted for the full length of the machine at one or both sides as required. The whole unit is transported by sliding on the tubular steel skids.

The motorized driving drum is rated at 2 h.p. and incorporates the electric motor and reduction gearing. The motor leads are brought out to a junction box fitted with a standard 30 amp. restrained type FLP plug and socket, so that the conveyor can be run from a standard drill panel. The belt supplied is P.V.C. 3-ply, 32-oz. Tugron Duck with 3/64 in. top and back covers. Normal drum centres are 10 ft. but other lengths may be arranged to suit varying applications.

Photograph and diagram of the Fischer pocket-type filter



The stable hole conveyor by Sutcliffe, with near side spill plate removed

Capacity is 50 tons of coal per hr., drum centres are 10 ft., plus 3 in. adjustment, the overall length is 11 ft 6 in., overall height 18 in., and overall width 2 ft. 10 in. (over terminal box). Belt speed is 175 f.p.m., while the power required for the motorized drum is 2 h.p., 125 volts, 50 or 150 cycles, remote control starting. Supply is from standard drill panel. Weight complete is 6 cwt. 30 lb. and weight without detachable spill plates 5 cwt. 24 lb.

AN AUTOMATIC DUST FILTER

In collaboration with the German company of Otto Hubbe, Keith Blackman Ltd., are now manufacturing under an exclusive licence arrangement the Fischer automatic dust filter. This filter is available in two basic types, one of square section containing 24 rectangular filter pockets and the other of circular section containing 27 circular filter sleeves.

In operation, the dust-laden air enters at (1) as shown in the diagram and passes down into the collection hopper where the heavy particles are settled out. The air then passes through the fabric filter pockets in the filter chamber where the remaining dust is trapped while the clean air passes out at the clean air outlet (2) and into the main extraction duct leading to the fan, the filter chamber always operating under suction.

Two or more filters are installed adjacent to one another, the number depending on the volume of air and dust

passing into the filters. At pre-determined intervals which depend on the conditions under which the plant is operating, a motor-operated damper in one of the filters causes the dust-laden air to bypass the filter which then undergoes its cleaning cycle. This same motor simultaneously opens another damper and air is drawn through the purging air inlet (3) into the filter chamber (which is under suction), passes through the pockets in the reverse direction (from outside to inside) carrying the collected dust into the main dust collection hopper where most is deposited. The purging air then passes through (1) into the inlet duct to be mixed with the dust-laden air which is being directed to the adjacent filters which are meanwhile in normal operation.

While the reverse process is taking place a unique high frequency vibrating mechanism agitates the pockets in a horizontal plane to dislodge the dust particles clinging to the filter bags. At no time is the filter fabric subjected to the stresses often caused by the concertina effect of vertical shaking gear. Thus the Tornado-Fischer filter sleeves or pockets are represented as having a much longer life, reducing maintenance and replacement costs to a minimum.

The Fischer filter has met with considerable success in Europe.

UNDERGROUND SURVEYS BY GYRO-COMPASS

Although, in the past, efforts to provide an accurate means of transferring meridian underground by using a gyrocompass have failed, chiefly because of inaccuracy or because of prohibitive size and cost of the unit, the gyro-compass is now being much improved in accuracy, as well as greatly reduced in size, to a stage where it might well be useful for certain phases of underground surveying.

An accurate meridian-indicator, manufactured by Otto Fennel-Söhne, of Kassel, West Germany, has been developed for underground surveying by Otto Rellensmann and his associates at Clausthal Mining Academy. The smaller version of this weighs 76 lb. and includes instrument tripod, transistorized generator and batteries. This gyro-theodolite can determine or check bearings of lines to approximately 30 in. of true direction when related to polar north. This is generally better than the accuracies obtained when bearings are taken underground by conventional wire methods through single shafts.

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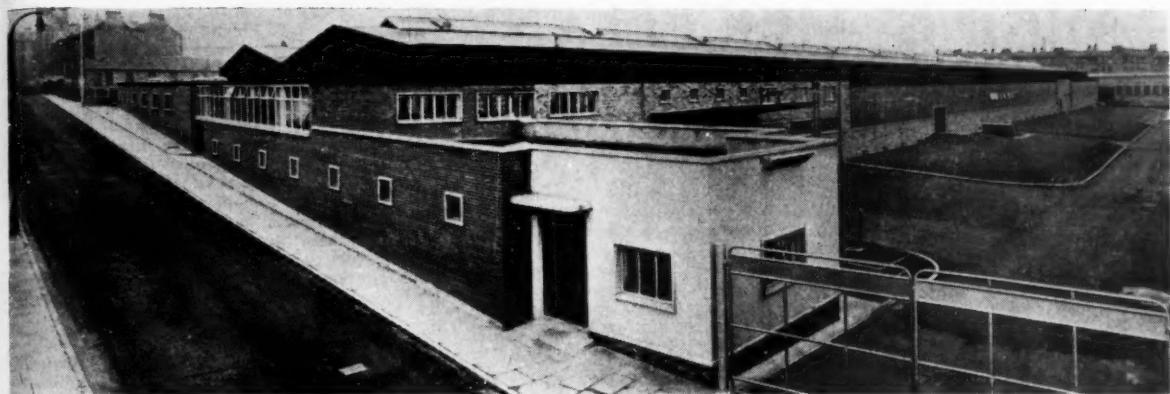
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A view of the new hose factory of The North British Rubber Co. Ltd. at Castle Mills, Edinburgh. The new plant is at the extreme western end of the company's 22 acres. Space has been left for future expansion

Two gyro-theodolites in constant use in the Ruhr coal-mining district are operated under the direction of the Gyro-Measuring Station of the Bochum Mining School. Extensive measurements have also been made at the Kiruna iron mines and the Boliden base metal properties in Northern Sweden with good results.

Since the gyro-theodolite measures angles from the astronomic north, it is particularly useful for orienting underground surveys. Operating independently of other methods, it provides a check on previous surveys and many of the difficulties associated with methods currently employed for the transfer of directions from surface to underground, such as the condition of the shaft, depth, air currents, dripping water, magnetic influences and hoisting operations, can be eliminated by suitable application of the meridian indicator. Other uses for this instrument include surveys for geographers, cartographers and geologists and inertial guidance for the control of automatic mining machines.

A counterpart to the German theodolite has been produced by Autometrics, a division of North American Aviation under the name ABLE. It weighs less than 100 lb. and is powered by either 115 V single or three-phase current, at 60 or 400 cycles a.c., or by 28 V. d.c. at 125 W. Alignment time is 15 min. at 30 deg. latitude and 30 min. at 60 deg. to 70 deg. latitude.

In operation, the gyro is aligned by increments until the component of the earth rate lying along the gyro input axis is zero. At this point, no restraint is required, the indicator shows nil and the north-south baseline is established.

Unfortunately, the cost of these instruments is high and only major companies operating several groups of underground mines could justify the purchase. It has been suggested, however, that smaller companies might be able to rent them from a central agency such as the U.S. Bureau of Mines.

Over a number of years, the Sperry-Sun Surwell gyro well-surveying unit has been used to good purpose in surveying boreholes in both the petroleum and mining industries, but it cannot be used where the drillhole has a casing size of less than 6½ in. outside dia. This excludes the unit in surveys of diamond drillholes as used in mining for which the NX hole at about 3 in. outside dia. is the largest size employed. The magnetic compass is satisfactory for determining the direction of inclination if the hole is not cased or if rocks are non-magnetic. Where this condition does not

obtain, there is no satisfactory method of determining bottom co-ordinates and there has been much interest shown in the development of a gyro-compass package of 2 to 3 in. dia.

In this connection a new Honeywell miniature gyro with associated electro-mechanical equipment uses a technique which promises size reduction to 3 in. dia. or less. Although only 1.75 in. in dia. and weighing 0.5 lb., its gyro sensitivity permits finding north to a fraction of degree in most latitudes and results from the greatly reduced frictional restraints realized by floating the gyro's moving element in a special heavy viscous fluid called Fluorolube. The gyro wheel spins in an inert gas within the floated gimbal, which is positioned by watchmaker-type pivots and jewels. Friction levels of about 0.01 dyne-cm are achieved and since the gyro wheel momentum is 10^5 gm-cm² per sec. about 7.5 dyne-cm torque is developed for the earth's turning ratio of 15 deg. per hr.

NEW HOSE FACTORY

On December 15, 1959, Lord Craigton, Minister of State for Scotland and Sir Ian A. Johnson-Gilbert, Lord Provost of Edinburgh, visited the Castle Mills, Edinburgh, factory of The North British Rubber Co. Ltd., to view the new hose plant, which is the main feature of the company's £3,000,000 modernization programme just completed.

The manufacture of hose has always been one of the main products of North British Rubber, and hose for use in all departments of the mining industry has held an impressive place in the company's endeavours. In the past ten years the company has made spectacular progress in the manufacture of giant oil hose which is 90 per cent export. The new layout represents a straight line flow from rubber and fabric storage to calenders and extruders, fabric cutting, braiders, vulcanizers, inspection and despatch departments. The plant is completely serviced by a series of 60-ft. wide overhead cranes. Particular attention has been paid to hydraulic equipment for the testing of all heavy hose. This is particularly important in the case of oil and rotary drill hose.

The new equipment has enabled North British to concentrate on braided

hose, features of which are lightness and flexibility. Certain lines of wire braided hose are made to withstand a pressure of 5,000-6,000 lb. p.s.i. The Edinburgh company has made a valuable contribution to Britain's exports in recent years, partially through rotary drill hose for oilfields all over the world. Many of the new hoses being manufactured in Edinburgh are made from synthetic rubber and are resistant to oils and chemicals. Much of the fabric and wire, the main raw materials apart from rubber, come from Scottish factories.

RAISE DESIGN AT REHABILITATED MINE

In connection with a project to rehabilitate an old mine in the Front Range mineral belt of Colorado, it was decided to raise above the old workings and cut into the veins at 276 ft. and 576 ft. This would by-pass the old workings and open a potential 90,000 tons of gold, silver, copper, lead and zinc ore and put the project into pilot production.

The raise is circular in shape, 9 ft. in dia. and 600 ft. high. Provision was made for steel sets, two 24-in. steel pipe ore passes, man and material cage, ladder way, air and power lines and ventilation equipment. A large station cut at the foot of the raise was adequate for two rounds of raise muck and allowed the work cage to pass.

DUAL ROTATION DRILL

Claimed, in competitive demonstrations, to have drilled faster and to have finished blast holes which conventional reverse rotation machines could not bottom, a new Joy 450-DR dual rotation drill has recently been placed on the market.

Dual rotation is provided by a powerful vane-type air motor geared to the chuck. It provides a boost to normal drilling rotation, gives extra rotation power and reduces the strain on the rifle bar. Cost cutting is claimed because there is no hammering action while coupling or uncoupling, permitting drill steel threads, couplings and striking bars to last longer; all four pawls are used only for forward rotation, thereby eliminating excessive pawl wear; and reversing is not rifle bar actuated and rifle nuts cannot back off.

MINING MISCELLANY

The whole of the development scheme put forward by the Skinningrove Iron Co. Ltd. early in 1959 has now been officially endorsed. The two new housings for the 36 in. rolling mill are now being made and will be installed in August, 1960. Work on the new crushing, screening and sintering plant for the preparation of blast furnace ores is to start soon. Total expenditure will be approximately £1,000,000.

The Third Oxford course of the Purchasing Officers Association includes for the first time material study groups (in co-operation with the British Iron and Steel Federation and the British Non-Ferrous Metals Federation) and an operations research study group. The course will be held at Christ Church and Pembroke College, Oxford, from March 21, to March 25, 1960. A full programme may be obtained from The Secretary, Purchasing Officers Association, Wardrobe Court, 146a Queen Victoria Street.

Mattagami Lake Mines has received formal notice that the development group, consisting of Noranda Mines, McIntyre Porcupine and Canadian Exploration, has exercised its option due on December 1. It has been reported in the Canadian Press that actual expenditures are understood to have exceeded the minimum required to be put up by the date mentioned. Indeed, the expenditures involved the spending of \$400,000 in return for 320,000 shares, plus the purchase of 800,000 shares for \$1,000,000. By December 1, 1960, the development group must purchase the balance of the treasury shares and give a commitment to put the property into production. However, there is a good chance that the decision may be made much sooner, as it is known that serious investigations of the production programme have been carried out for some time.

Some 41 Malayan tin mines will reopen next month following the raising of the export quota for tin. The Inspector of Mines has informed 93 mines that the Central Committee has authorized resumption of work. Of this number 41 have given notice of their intention to recommence operations. Two new properties have also been authorized to start work. Official figures show that 455 mines were in operation at the end of October. This is 22 more than at the end of September.

According to a recent issue of the Turkish Government Gazette, the export of mined minerals from Turkey has been removed from all restrictions. This ruling, together with regulations concerning the export of other items and general import regulations came into effect as from December 3 last.

The Minister of Power has made Orders under Section 117 of the Mines and Quarries Act, 1954, revising and extending the list of classes of dangerous occurrences at mines and quarries which are required to be notified under the

Act. The revision is made necessary because of technical changes which have arisen in mining and quarrying operations since the existing requirements were made. The Mines (Notification of Dangerous Occurrences) Order, 1959, revokes the existing Orders relating to the notification of dangerous occurrences at mines and at quarries and replaces them in respect of mines only. The Order comes into force on January 1, 1960. The Quarries (Notification of Dangerous Occurrences) Order, 1959, also comes into force on January 1, 1960.

Improvements to the three Brazilian railways connecting the Minas Gerais iron ore mines to the three ports of Rio, Vitoria and Angra dos Reis have raised annual export capacity to 11,000,000 tons. In June last, trains of 99 wagons, hauled by eight 1,600 h.p. diesel-electric locomotives, conveyed loads of 7,835 tons of ore from Lafaiete to Volta Redonda. The Minas Gerais Iron Quadrilateral, alone, has reserves of 15,000,000,000 tons of ore, averaging 65 per cent Fe, but exports have until now been limited by transportation difficulties.

Ermirio de Moraes, a prominent industrialist in Brazil, has obtained a licence to prospect for zinc, copper, lead and associated minerals on his property of 80 hectares, part of an estate of 500 hectares recently sold to Vazante, Minas Gerais, Brazil (*vide The Mining Journal*, May 30, 1958). The purchasers of the remaining lots have safeguarded their mining rights in accordance with Article 26 of the Code of Mines.

Three new areas, two in the Gwelo district and one in Gatoomba, will be open for mineral prospecting and pegging from January 4, 1960, following an agreement between the Southern Rhodesia Government and the owners of the Rennie Tailour concessions. The areas are the Sebakwe and East Clare Blocks in the Gwelo district, and sections 3 to 12 of the Umsweswe Block in the Gatoomba district. Concession rights in these areas expired on November 30 last. In a statement issued by the Southern Rhodesia Minister of Mines, Mr. C. J. Hatty, said negotiations to secure termination of the concessions under the Mines and Minerals Act had been undertaken "in pursuance of government policy in opening up areas for mineral prospecting and pegging". The government would pay £5,000 to the London and Rhodesian Mining and Land Co., in compensation for the loss of mineral rights, resulting from termination of the concession. The company would also retain the right to peg and register claims in Sections 1 and 2 of the Umsweswe Block, and to a limited number of blocks of claims in the Sebakwe Block.

A new company, Brazilian Iron Ore S.A., has been organized in Luxembourg with an initial capital of 150,000 Belgian francs, to exploit iron ore deposits in Brazil.

According to estimates reported by the Base Metals Association of the Philippines, Japan's annual iron ore import requirements may reach 27,700,000 tonnes by 1967. Some authorized sources in Japan place the needs even higher. In view of the projected expansion of the Japanese steel industry, the entire available iron ore output from foreign sources may be absorbed in the next five years. Under current contracts, with mines in the Philippines, Malaya, India and North America, the total volume of Japanese ore imports for this year is expected to amount to 10,900,000—2,400,000 tonnes more than the earlier estimate.

Lithium-bearing pegmatite deposits were found earlier this year by geologists employed by the Mali Federation in the Bougouni region of the French Sudan, about 100 miles from Bamako, and near the road connecting Bougouni with Bobo-Dioulasso in Upper Volta. The Mali Federation includes the State of Senegal and the Sudanese Republic, formerly the French Sudan. So far five lithium-bearing pegmatite deposits have been identified in the Bougouni region. The reserve is estimated at 1,300,000 tons and reportedly contains 250,000 tons of spodumene, which has 7 per cent lithium oxide (Li_2O). It is believed that other dykes of similar importance exist under a laterite cover, but so far as is known the ore does not contain beryl.

The Chilean Government has requested and obtained the technical and financial aid of the United Nations Special Fund to conduct a survey of the mineral resources in the northern provinces of Chile. To finance the plan, the Special Fund is to contribute \$1,000,000 while the Chilean government will contribute \$700,000. The plan is to be carried out in two and a half years, starting next January.

Surigao Consolidated Mining Co., reported that recent development work on its copper property in Zamboanga del Sur, the Phillipines, has uncovered numerous outcrops over an area covered by 200 claims. They are now being developed by diamond drilling and tunnels.

According to a company representative, the Morrison-Knudsen Co., Ltd., and Morrison and Cyprus Mining Co., may develop an iron ore deposit in the Northern Mountain Range of Trinidad. Outcroppings of the ore are encouraging; definite plans cannot be made prior to conclusion of additional surveys which are to be completed within the next four months.

The Gold Producers' Committee of the South African Chamber of Mines has made a grant of £150,000 for a students' residence at the University of Witwatersrand as a tribute to the part that the University has played in the progress of the mining industry. Dr. P. W. J. Busschau president of the Chamber of Mines said that the University was providing the men in top management in the industry on a major scale. Of the 1,200 graduates employed in the mining industry, almost half had at least one degree of the University of the Witwatersrand.

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Metals and Minerals

Bikita Acquires New Lithium Property

In June this year it was announced by Selection Trust that the property of Bikita Minerals in Southern Rhodesia was to be placed on a care and maintenance basis early in 1960. Bikita Minerals was developed as a large-scale mining operation which, for the first five years, was to devote the greater part of its production to a contract with American Lithium Chemicals. The latter company was under contract to supply the Atomic Energy Commission with lithium hydroxide. These contracts expire at the end of 1960, after which, it was pointed out in the announcement, Bikita's sales might be confined to the supply of high-grade ores to glassmakers. The intention, therefore, was that after sufficient stocks of high-grade products had been built up to ensure a continuity of supply to glassmakers and other consumers for at least five years, the mine should be placed on a care and maintenance basis until the market situation improved.

It is now stated that Bikita Minerals is not, after all, to be placed on a care and maintenance basis early next year. The decision to continue production stems from an improvement in the demand for lithium ores. In addition, the company has bought the adjoining property hitherto owned and operated by Mr. George H. Nolan. This contains part of the same orebody already being mined by Bikita, but whereas Bikita's mineralization contains primarily lepidolite and beryl, with subsidiary spodumene, amblygonite and pollucite, the newly-acquired section also has large reserves of high-grade petalite as well as subsidiary spodumene and eucryptite. The two properties can readily be worked as a single mining operation, and Bikita is now in a position to supply all types of lithium ores to glass and other industries as well as to manufacturers of lithium chemicals.

Coming, as it does, at a time when lithium—like so many other metals—has been passing through a period of uncertainty, the extension of Bikita's resources and the decision to continue production are encouraging indications that short-term prospects are brightening, besides being an impressive demonstration of confidence in the long-term outlook for one of the most promising of the newer metals.

Following the refusal by the Lithium Corporation of America to accept any further shipments of lithia from Quebec Lithium, the Canadian producer has temporarily suspended its mining and milling operations. Supplies of spodumene concentrate on hand are reported to be sufficient for the production of about 2,000,000 lb. of lithium carbonate and the company has a stockpile large enough to meet the requirements of the glass industry for many months.

ALUMINIUM PRICE INCREASES

Since the report in this column last week of price increases by various North American aluminium producers, Kaiser

and Reynolds Metals have come into line with Alcoa by announcing that their prices for primary aluminium would be raised by 1.3 c. The increase, applicable to 99½ per cent purity pig, restores the domestic price to the 1957 level of 26 c. a lb. Aluminium Ltd., Canada's biggest aluminium producer and a substantial exporter to the U.S., has also increased its price of aluminium in the U.S. market by 1.3 c. to 26 c. a lb., effective on December 19. This follows an increase of 4 c. made by Aluminium Ltd. in its other markets on December 16. Similar increases have been announced by Norway's largest producer, the government-owned Aardal et Sunndal Verk A/S.

For the nine months ended September 30, Reynolds Metals reported sales of \$366,000,000 against \$333,000,000 in the corresponding period of 1958, Mr. John H. Krey, vice-president of the company, told the New York Society of Security Analysts. Reynolds Metals is currently operating at about 80 per cent of capacity of 634,000 tons of primary aluminium and an additional 67,000 tons of capacity will soon be available. Mr. Krey stated that no new major construction was scheduled for 1960, "a rare interval in the company's growth", but between \$30,000,000 and \$40,000,000 will be spent for normal replacement and improvement.

A new company, Alcan (U.K.) Ltd. has been formed in Britain to take over the business of the London branch of the Canadian company of the same name, starting on January 1, 1960. The new company, like its predecessor, is a wholly-owned subsidiary of Aluminium Ltd. It will be responsible for distribution in the U.K., Eire and Scandinavia of aluminium and other magnesium, bauxite and chemicals produced by associated companies.

CADMIUM STOCKS DECLINE

In view of the recent rise in cadmium prices, particular interest attaches to the latest Bureau of Mines Statistics, which reveal that in the third quarter of 1959 total cadmium metal stocks in the U.S. declined by 18 per cent to 4,300,000 lb. Primary and secondary cadmium metal production declined 16 per cent to 1,900,000 lb. as compared with the second quarter of 1959, and was 19 per cent below the third quarter of 1958. Shipments of cadmium metal by producers, including internal plant consumption, declined by 6 per cent to 2,800,000 lb. compared with the second quarter of 1959, but were 53 per cent higher than in the third quarter of 1958. General imports of metal decreased by 33 per cent and for nine months of 1959 were

about equal to those for all of 1958. General imports of the flue dust decreased by 373 per cent.

The U.K. domestic price was raised on December 21 to 10s. from 9s. 6d. per lb. delivered, with immediate effect. The price was raised by a similar amount in November. The latest increase applies to Commonwealth and domestically produced cadmium.

CHROME OUTLOOK BRIGHTENS

The outlook for the chrome ore market next year is being viewed in London with what is described as quiet optimism. Demand is not yet widespread, but more buying interest is apparent, although the better feeling now beginning to emerge has not yet had any visible effect on prices. The rising trend in steel demand throughout the world should lead to a healthier chrome ore market, especially if there is no further interruption of production in the U.S. after the 80-day cooling off period next month. Some observers believe that stocks of ore in the U.S. are now much lower, and that a return to normal buying by that country could have quite an effect on the market. While prices of chrome ore still remain at a depressed level, it seems reasonable to conclude that any future movement will probably be upwards.

It is perhaps not without significance that U.K. ferro-chrome prices are to be advanced by one half-penny as from January 1, 1960. This increase—the first for nearly three years—will lift the price of average 68/70 chrome of 0.04 per cent carbon content to 2s. 1½d. per lb. delivered.

U.K. imports of chrome ore from all sources during January–October, 1959, totalled 139,094 tons compared with 152,346 tons over the corresponding period of 1958.

The Allied Chemical Corporation, a leading American producer of chromium chemicals, is to acquire 51 per cent of the shares of the Montrose Exploration Co., a British company quoted on the London Stock Exchange. The shares of Montrose, which owns chrome ore deposits and mines in the Transvaal, will be held by Allied's wholly-owned South African subsidiary. It was also announced that Allied Chemical had entered into a long-term contract with Montrose for its requirements of chrome ore.

According to an announcement by the Mitsubishi Shoji Kaisha, a leading Japanese trading firm, the Nippon Kokan Co. has concluded contracts for exporting a total of 1,400 tons of low-carbon ferro-chrome to the U.S. and Australia. This is claimed to be the largest export contract for ferrochrome on a commercial basis, except for those concluded with the Commodity Credit Corporation or General Services Administration Office for the U.S. Government stockpile programme. Of the total amount involved, 500 tons are destined for the U.S. and the balance for Australia.

Owing to the Christmas holidays, our regular market features do not appear this week. They will be resumed in our next issue.

Mining Finance

Federale Mynbou and Afrikaner Volksheid

The name of Federale Mynbou Beperk is probably unfamiliar to most investors outside the Union of South Africa. It is, nevertheless, a name that is going to become increasingly important in African mining as time proceeds.

Federale Mynbou, as its name implies, is the first major venture into mining finance by Afrikaner interests. Formed in 1953 by Bonscor and Federale Volksbeleggings, Mynbou initially administered only two operating companies: Koornfontein Collieries and Klippoortje Collieries. Sanlam became a third major shareholder in 1955, and six years after its flotation, Mynbou offered a participation to the public.

Meanwhile, the company's mining interests had grown, to the stage at which it could describe itself as a mining house. Coal remained the predominating interest, although the spectrum of Mynbou's operations had widened considerably. The market value of Mynbou's investments is now a little under £2,000,000, and profits last year were £184,017 before tax. This is still small by the standards of the "big seven", but these are early days.

Expansion is going forward in three main directions: co-operation with other mining houses in prospecting, underwriting, &c.; acquisition of interests in proven or prospective mining concerns; and actual prospecting by a subsidiary, Federale Prospektreiders Bpk. Co-operation has brought Mynbou interests in several recent flotations—Winkelhaak, Western Areas, Bracken and Leslie, to name a few—while interests acquired include stakes in several small and medium-sized mining companies. It is, however, the third method—actual prospecting—on which the future of Federale as a fully-fledged mining house must depend. It is Federale's avowed ambition to float its own big gold mine, and the company is prepared to spend big money to find one. Although the parent is still young, the prospecting subsidiary is fully equipped to use the geophysical and other scientific methods which remove some, though by no means all, of the risk from this essentially chancy business.

It is in this respect that Federale's present situation differs from that of the other mining groups in their early years. Almost without exception, the other houses were formed around a nucleus of already established producing gold mines. The steady income thus provided meant that time was on their side in their prospecting operations. For Federale, on the other hand, current profits stem mainly from sharedealing, with the result that expensive prospecting can only be carried out in periods of buoyant market activity. Federale's present activity is in the nature of a crash programme, and on it depends the answer to the question mark overhanging Federale's future: will it stagnate as one small holding company among many, or will it join the "big seven" as a mining house in its own right?

This is a question that has implications far beyond Federale's balance sheet. Bluntly, Federale is an attempt to overcome the Afrikaner's jealousy and mistrust of the present mining set-up, which is largely controlled by "British" South Africans. Should the experiment succeed, Afrikaners will be able to look "British" mining interests in the eye, with the almost certain result that the S.A. investment climate will improve; should it fail, some Afrikaner elements will blame the failure on an

imaginary closed shop of "British" interests. At best, this would mean that the industry would have on its hands a vast exercise in public relations; at worst, the future of the industry in its present form might be in jeopardy.

This is a question that has implications far beyond the confines of Federale's balance sheet. Hitherto, Afrikaner interest in mining investment has been limited to those close to the heart of things in Johannesburg and other mining and business centres in the Union. This has been partly due to an absence of sufficient savings in the hands of small farmers and the like, and partly to a mistrust and indeed jealousy of an industry concentrated in the hands of "British" South Africans. But now in South Africa, as elsewhere, the age of the little man is transferring savings from the hands of a comparative few into the pockets of the public at large, and it is to these small savings that industry in the Union, as elsewhere, is looking increasingly for its new capital.

Federale is, therefore, an attempt to channel this "new" money into a form of investment acceptable to it. It can also be seen as a part of the pattern of growing Afrikaner participation in industry and commerce; not, it should be stressed, in the pockets of the public at large, and it is to these small savings that industry in the Union, as elsewhere, is looking increasingly for its new capital.

However, the Afrikaner investor is by instinct as much the "economic" man as his counterpart elsewhere, so that Federale, and similar companies in other industries and business generally, must prove themselves to be at least the equals of their "British" counterparts in investment attraction.

It is, of course, of the utmost importance that this particular venture should succeed, not merely because of the new money which it may attract into the gold industry, but still more because of the obvious advantage to the industry of having Afrikaner financial interests as partners instead of envious outsiders. Should the venture fail there are certain to be Afrikaner elements who will blame the failure on an imaginary closed shop of "British" interests. At best this would involve the industry in a vast and difficult exercise in public relations; while, if the political climate were at the same time to deteriorate (a development which the British Labour Party at present seems bent on fostering) the future of the industry in its present form might even be in jeopardy.

BIG EVENT FOR MALAYAN TIN

The big event of 1959 for the Tronoh-Malayan group of tin mining companies has undoubtedly been the commissioning by Malayan Tin Dredging of its new 4a dredge. Not the least remarkable aspect of this event was the fact that the dredge was brought to profitable production in less than 16 months after construction work began. Praise for this achievement is due

to F. W. Payne and Son, who designed the dredge, and also to the foresight of the mine's planning staff whose advance planning over five years ago made it possible for the unit to begin mining tin almost immediately it was commissioned, instead of spending a period in digging down to working depth.

The impact of the new dredge on Malayan's earnings will be immense. This is illustrated by the fact that its quota for the current period works out at 358½ tons, only 14 tons less than the combined quota for Malayan's other four units. A foretaste of things to come is given in the statement by Mr. F. G. Charlesworth (page 668). In spite of the proposed one-for-one scrip issue, he states, it will be possible to pay the same rate of dividend next year as was paid this year, subject, of course, to unforeseen developments.

In the wider field of tin economics, Mr. Charlesworth has set down his views on the coming decision as to whether or not the International Tin Agreement which expires in 1961 should be renewed next year. Mr. Charlesworth believes that the main defect of the present agreement is that China and the U.S.S.R. are not party to it. Renewal of the agreement, he thinks, should largely depend on whether these two countries can in some way be brought into the agreement.

Meanwhile, the group is having the same sort of trouble with State Councils on the question of mining rights as was described here in connection with Meru Tin some weeks ago. The main sufferer in the Tronoh group is Kramat Pulai, who were informed in May of this year that a mining lease over 650 acres of land at Kampong Binjai had been granted in error—in September 1956. Mr. Charlesworth makes no comment, but it is apparent that a great deal has yet to be done before the land position in Malaya can be described as satisfactory. This is all the more regrettable since in other respects the Federal and local governments in Malaya have proved themselves so competent.

Results of the Tronoh-Malayan group companies for 1958-9 are tabulated below.

TWO AND TWO MAKE 4.00000

The past few weeks have seen a remarkable spate of publicity for Kaffirs in the shape of brokers' and jobbers' circulars. This is to be welcomed.

There is, however, one fault to which those who prepare these circulars are particularly prone. This is over-precision in long-term forecasting. One recent circular, for example, has given not only expected rates of dividend over a long period of years, but also estimated rates of capital appreciation.

Given the premises on which these estimates are based, this sort of forecasting can be useful to the specialist who is able to weigh up the situation for himself. To the general investor, however—and it is to him that such circulars are addressed—such exactitude can be misleading, to say the least. A well-informed market operates to the advantage of all concerned; the temptation, given such precise forecasting, is for the investor to act on an estimate without understanding the underlying argu-

Company	Year to June 30	Profit after Tax	Dividends	Carry Forward
Malayan	1958	430,187	189,750	430,236
	1959	180,112	168,457	190,600
S. Malayan	1958	584,735	331,584	97,298
	1959	182,649	218,052	56,895
Sungei Besi	1958	128,030	70,522	89,115
	1959	62,591	48,855	97,761
Ayer Hitam	1958	124,796	43,844	111,284
	1959	109,109	73,867	110,338

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ment. Nowhere are half-truths more dangerous than in the Kaffir market.

Having said this, it is only fair to add that the authors of two recent brochures have avoided most of these pitfalls. One, published by a firm of brokers, deals with the prospects of most of the new mines, and includes a section on finance houses and investment companies. There is also a valuable sketch of the tax situation as it applies to Kaffir shares. On the other hand we cannot agree with some of the author's conclusions.

In taking account of uranium earnings after the contracts end, for example, he has chosen to work on the basis that such profits will be at half the present rate. If this was intended as no more than an arbitrary figure, we would have no argument, but the brochure implies that a reduction of 50 per cent will probably prove to be an over-conservative basis. The fact is that if the free uranium price of the mid-1960's is as little as 25 per cent lower than the contract price, this would be sufficient to make production entirely uneconomic at several producers, while the profit margin at most other mines would certainly be reduced by more than 50 per cent. Even at Hartebeestfontein, halving the uranium working profits implies a reduction in the price of only 30s. per lb. from the current 76s. odd. With other factors such as upgrading mill head values and a possible recrudescence of the upward trend of costs complicating matters, the most that can be said at present is that earnings will be sharply reduced, and that the effect will vary substantially between individual mines.

The other circular to which we would like to draw special attention is produced at

intervals by a firm of jobbers, and deals with mines now in the final phases of their lives. Again some of the assumptions made are contentious, but as a concise guide to the facts in this highly specialized section of the market, the circular serves its purpose admirably.

LAKE VIEW'S RECORD YEAR

The year 1958-9 was a most satisfactory one for Lake View and Star. Among the landmarks were a record tonnage of 753,857 put through the mill, and a rise in ore reserves to 3,575,000 s. tons, the first improvement for four years. The most notable event of all, however, was one which actually took place soon after the financial year ended. This was the installation of an electric winder at Chaffers shaft.

Unfortunately, in an inflationary era like the present, it "takes all the running you can do to stay in the same place." Over the past six years, three other shafts had been electrified: Associated, Lake View and Ivanhoe. Over the same period, however, costs other than hoisting have risen by 2s. 11d. per ton, so that in spite of a reduction of 1s. 4d. per ton in hoisting costs, overall working expenditure rose by 1s. 7d. per ton. The Chaffers shaft electrification will result in a further saving of some 9d. per ton, but here again it is expected that rising costs will absorb much of the benefit.

Nevertheless, Lake View is to be congratulated on the tight rein it has held on costs in a period when almost automatic increases in the basic wage have been granted by the arbitration court. Were it not for this, there can be no doubt but that shareholders would not be enjoying the current

high rate of dividend. Nor would Sir Joseph Ball, the chairman, be in a position to state that if costs can be held in the future as well as in the past, it should be possible to maintain the current rate of dividend.

Extracts from Sir Joseph's statement appear below.

R.S.T. GROUP APPOINTMENTS

The Rhodesian Selection Trust group of companies announces the following appointments to take effect from April 1st, 1960:

Mr. J. H. Lascelles, O.B.E., T.D., will cease to be executive vice-president at Head Office in Salisbury and will become resident director in London.

Mr. Jack Thomson, O.B.E., will cease to be Head of the Rhodesian Department of Selection Trust in London and will become resident director in Lusaka, Northern Rhodesia.

Mr. F. E. Buch will cease to be general manager of Mufulira Copper Mines and will join the head office in Salisbury with the title of vice-president and assistant to the president.

Mr. G. B. Brebner, controller of the group, to be a vice-president, retaining his office as controller.

Mr. N. M. Kenny, general manager of Roan Antelope Copper Mines to be general manager of Mufulira Copper Mines.

Mr. J. L. Reid, manager of Roan Antelope Copper Mines to be general manager of that company and Mr. H. J. Wedgwood, assistant manager of Roan Antelope Copper Mines to be manager of that company.

LAKE VIEW AND STAR

SIR JOSEPH BALL'S SPEECH

The Forty-ninth Annual General Meeting of Lake View and Star Limited was held on December 16, 1959, in London.

Sir Joseph Ball, K.B.E. (the Chairman), in the course of his speech said:—

An increase in gold production, which rose by 3,198 oz. resulted in an increase in revenue for the year ended June 30, 1959, of over £31,634 over the figure for the previous year. As against this, however, there was a further rise in working costs of 2d. per ton of ore milled, due mainly to increases in the basic wage, but partly also to the extra cost of development resulting from an increase in footage of 3,209 feet. The net result was an overall increase in the mining profit of £8,495 which, having regard to persistently rising costs, must be considered very satisfactory.

The large provision for depreciation of plant and machinery of £55,440 reflects the addition of the capital equipment which has been installed during the year.

The Company has maintained its qualification as an Overseas Trade Corporation and is therefore assessed for tax purposes on this basis.

An interim dividend of 1s. per share was paid during the year, absorbing a net amount of £85,750, and a final dividend of 1s. 6d. per share is recommended which will absorb a net sum of £128,625. The unappropriated profit carried forward amounts to £75,905 as compared with £70,932 brought in.

I am pleased to report that the development footage accomplished during the year at 28,654 feet showed an in-

crease of 3,209 feet over the figure for the previous year.

The ore reserves on July 1, 1959, amounted to 3,575,000 short tons at an average grade of 4.85 dwt. per ton. Compared with last year this shows an increase in reserves, the first since 1953/54, of 44,600 tons, with an improvement in grade from 4.84 dwt.

The tonnage milled (753,857 tons) constituted a new record throughput in the history of the Company's operations, and shows an increase of 10,408 tons over that for the previous year. The gold recovered increased by 3,198 oz. to 163,721 oz.

The big event of the last few months has been the bringing into operation of the new winder at Chaffers, and this is now in full operation and is reported to be doing a splendid job.

In passing I feel I must give full credit to the vigilance of our Technical Advisers, New Consolidated Gold Fields Limited, who, very soon after the programme was authorized, were able to locate and secure, for almost immediate delivery and at a favourable price, a Ward-Leonard Hoist. As a result of this the complete electrification programme for the Chaffers shaft, with its resultant saving, should be in force almost a year ahead of the date anticipated when the conversion programme was approved by the Board.

Electrification of Chaffers Shaft

The two alternators required for the provision of the additional standby power necessitated by the electrification programme, are now on the Mine, and should soon be in operation. The final phase of the Chaffers project to be

undertaken concerns the electrification of the auxiliary winder which was scheduled to come into operation on electric drive two days ago. The Chaffers project is the final stage of the electrification of all the main shafts.

I have referred repeatedly in past years to the adverse effect on mining costs of the almost automatic increases in the basic wage, which are unfortunately a feature of the Australian economy. During the last ten years working costs have risen by no less than 15s. per ton.

However, in the past six years—during a period of persistent wage increases imposed by the Arbitration Court—the rise in working costs has been restricted to 1s. 7d. per ton. By June 30, 1959, as a result of the progressive electrification of the Associated, Lake View and Ivanhoe shafts, hoisting costs had been reduced by 1s. 4d. per ton, from which it will be seen that the increase in costs over this period would have amounted to 2s. 11d. per ton had the electrification programme not been undertaken.

The Chaffers shaft electrification is expected to result in a further saving of 9d. per ton, but it seems that much of this saving may well be absorbed by rising costs. Indeed, since the close of our financial year there have already been two further increases in the basic wage totalling 4s. 8d. per week. Without the benefits of cheaper hoisting, shareholders would now be receiving substantially reduced dividends. As things stand, however, and providing that costs can be controlled in the future, as well as they have been in the past, profits should still permit the payment of the present dividend.

The Report and Accounts were adopted.

MALAYAN TIN DREDGING AND SOUTHERN MALAYAN TIN DREDGING

The Annual General Meetings of Malayan Tin Dredging, Ltd., and Southern Malayan Tin Dredging Ltd., were held on December 18, in London.

Mr. F. G. Charlesworth, Chairman, presided.

The following are extracts from his statements circulated to shareholders:—

MALAYAN TIN DREDGING LIMITED

The working profit for the year amounted to £306,862. After providing £122,960 for taxation, there remains a balance of £185,112 which, with the balance of £110,643 unappropriated at June 30, 1958, makes available £295,755. A final dividend of 6d. per share is recommended.

At June 30, 1959, our contributions to the Buffer Stock amounted to £158,300. These contributions constitute a frozen asset until such time as a distribution of or from the Buffer Stock is made. Mine Stocks, which consisted of 658 tons of tin concentrates, are another frozen asset until releases permit of their disposal.

Production

Operations during the year resulted in a production of 1,514 tons of tin concentrates, of which we were permitted to sell 1,116 tons.

Work on the construction of our new No. 4a Dredge was completed on July 26 this year. Twelve days later the dredge reached a previously prepared working site and, following a short running-in period, it has since been in steady production.

In accordance with the Tin Control Regulations, the estimated annual productive capacity of No. 4a Dredge has been assessed at 2,295 tons.

Increase and Issue of Capital

Members have received Notices of the Extraordinary General Meeting, at which resolutions will be proposed for increasing the authorized capital of the Company from £1,000,000 to £2,000,000, and authorizing the capitalization of £926,222 5s. and the issue of shares of that nominal amount credited as fully paid. If these resolutions are passed, members will receive one fully paid share of 5s. for each share of 5s. held by them.

The reason for these proposals is that the cost of the new dredge has been entirely provided from revenue and the Directors consider that this should now be recognized in the manner proposed.

Kramat Pulai Limited

During the year the Company completed the acquisition of the shares of Kramat Pulai Limited, which then became a wholly owned subsidiary.

There is one matter of which members should be informed. When the Company offered to acquire the whole of the issued capital of Kramat Pulai Limited, that company had been officially informed in September, 1956, that the granting of a Mining Lease over 1,050 acres of mining land at Kampong Binjai had been approved by the State Council of Perak on terms and conditions which

were acceptable to the Company. In May this year, after a lapse of nearly three years, we were informed that a mistake had been made in the official notification of September, 1956, and that at that time the State Council had only approved the granting of a Mining Lease over 400 acres and not over 1,050 acres as was clearly stated in the official notification. Meanwhile, Kramat Pulai Limited at present has an admitted right to a Mining Lease over 400 acres of mining land as Kampong Binjai and not over 1,050 acres as has hitherto been stated.

Aokam Tin Limited

The operations of this Company, in which we have a considerable financial interest, were again severely curtailed by the incidence of Tin Restriction. The Company's full Sales Quotas and its permissible stock of concentrates had been produced by the end of March, 1958, and the Grab Dredge was then closed down for eight months until the end of November, 1958. With the aid of additional quotas purchased from associated companies in Thailand, it was then possible to operate the dredge for eight months up to the end of July, 1959, when it was again closed down for two months, during which improvements and modifications to the plant were carried out. The dredge was restarted on October 1, 1959, and results since that date have been encouraging. With the likelihood that the burden of Restriction will be considerably lightened during the coming year, the prospects for this Company may be considered brighter than at any time since 1957, when the Grab Dredge started operating.

International Tin Agreement

The International Tin Agreement expires at the end of June, 1961, and an International Conference to consider renewal of the Agreement will be held under the auspices of the United Nations Organization in May next year.

Defects in the present Agreement, notably those arising from the fact that China, which is a large producer, and the U.S.S.R. are not parties, have, to the discomfiture of the countries which are, been amply demonstrated since the Agreement became operative, and it would seem that renewal should largely depend on whether China and the U.S.S.R. will agree to become parties or whether other effective means can be found for remedying the present defects.

Federation of Malaya

A further stage in the constitutional development of the Federation of Malaya was passed during the year when the Federal Legislative Council was dissolved, and on August 19 elections were held for the fully elected House of Representatives. The elections resulted in the Alliance Party being returned to power with a large majority. The Government is popular both at home in Malaya and overseas, and we can look forward to a long period of stable Government during which, I am confident, much will be achieved in the country with which our interests and those of the Commonwealth are so closely linked.

Communist terrorists have now been largely eliminated and the greater part of the Federation has been freed from their menace and the burden of the many restrictions on normal life made necessary by their activities.

SOUTHERN MALAYAN TIN DREDGING LIMITED

The working profit for the year amounted to £368,143. After providing £196,559 for taxation there remains a balance of £177,649, which, with the balance unappropriated at June 30, 1958, makes available £274,947.

A final dividend of 3d. per share is recommended.

At June 30, 1959, contributions to the Buffer Stock amounted to £221,208. These contributions constitute a frozen asset until a distribution of or from the Buffer Stock is made. Mine Stocks, which consist of 649 tons of tin concentrates, are another frozen asset until releases permit of their disposal.

Production amounted to 1,970 tons of tin concentrates, of which we were permitted to sell 1,744 tons.

Degong Road Section

Check boring on the western areas of this property generally confirms the values previously indicated and that the working of the property will be profitable, though it is recommended that, in the first place, dredging should be confined to a selected area of some 520 acres containing approximately 59,000,000 cubic yards of ground with an estimated recoverable value of 33 lb. per cubic yard. In addition, there is an area of 206 acres containing lower values which could be worked when conditions warrant its exploitation.

Coming Events

The Institution of Mining and Metallurgy have announced the dates for their general meetings during 1960, which will be held at 5 p.m. on the following days: January 21, February 18, March 17, April 21, May 19.

The Third International Congress of Surface Activity will be held in Cologne, Germany, from September 12 to 17, 1960, by the German Committee for Surface Active Substances.

The Institution of Mechanical Engineers will hold its summer meeting in Northern Ireland, June 20-23, 1960. It will be followed by a short visit to Dublin and district.

The South Wales Institute of Engineers will hold its annual dinner at the Park Hotel, Cardiff, on January 21, 1960.

Publications Received

Ransomes & Rapier, Ltd., have produced two illustrated booklets entitled *Engineering Products*, and *What We Make*, Nos. 1/526 and 5/464 respectively, which give pictures of their factories and equipment.

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